



A video projection at the London Science Museum's *Collider* exhibition takes visitors up close to CERN's particle accelerator.

PARTICLE PHYSICS

Smashing spectacle

Zeeya Merali weighs up a simulated tour of the Large Hadron Collider.

It is the world's biggest, most expensive science experiment, smashing protons together at the highest energies reached on Earth. The Large Hadron Collider (LHC) — the particle accelerator at CERN, Europe's high-energy physics laboratory near Geneva in Switzerland — feeds on superlatives. So curators attempting to recreate the experience of walking through its underground tunnels, which occupy a space 27 kilometres in diameter, faced a seemingly impossible task. But through a mixture of animation, audio and video, and a handful of objects, the London Science Museum's £1-million (US\$1.6-million) *Collider* exhibition just about pulls it off.

Targeting the over-16s, and consciously aiming to encourage budding physicists, the exhibition avoids the museum's trademark interactive games in favour of immersing visitors in the sights, sounds and culture of CERN. The focus is on the human motivation behind the machines, rather than on the theoretical physics or the accelerator's technological achievements.

The tour begins in a replica of CERN's auditorium. A short film reimagines the July 2012 announcement of the discovery of the Higgs boson — the final missing piece in the standard model of particle physics — that explains how matter acquires mass. Despite creditable performances, the actors could not quite deliver the enthusiasm that the LHC staff themselves showed in news reports; it would also have been welcome to

Collider Exhibition
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see a wider diversity of faces in the film.

Next, visitors — like the LHC's particle beams — must

move along a tightly prescribed curved path through the exhibition space. It was, of course, impossible to create a facsimile of the awe-inspiring underground caverns, lined with vast, intricate machinery. Nevertheless, a canny soundscape generates an authentic atmosphere, layering snippets of conversations between workers against the background hum of the detector. Loving attention to the low-tech detail that typifies much of CERN, including outdated computer towers and bicycles used to traverse the circuit, also lend credibility to the exhibition. Dull grey hallways lead to the office of a physicist who clearly eats and sleeps at her desk, conjuring the daily grind of science in action.

Along the route, traditional glass display cases contain small items of apparatus, such as hydrogen canisters and sections of magnets. These are brought to life by engaging life-size video footage of LHC researchers mixing technical explanations with anecdotes about working in the world's largest scientific collaboration. Charming hand-drawn diagrams, humorous cartoons and simple animations drip-feed background physics.

A highlight is the 270-degree wrap-around projection of the heart of the collider. Graphics zoom in to proton collisions and then back

out to depict experimental data as it is transmitted around the globe, helping the viewer to visualize the collider's extremes of scale.

The most detailed physics explanations are saved for the end. Here, we learn more about the search for the Higgs boson (which involved two years of collisions and some 10,000 people), such as how its presence was inferred through data analysis. In the final room, a delightful series of animations dance atop a white desk, vividly tracing out some of the biggest mysteries — such as the nature of dark matter, which the collider is now harnessed to crack. Enhanced by voice-overs from physicists, including CERN project leader Lyn Evans, this is a simple yet evocative way to convey complex theories. Both these voice-overs and the use of actual researchers in the earlier video clips hint at a lost opportunity: the opening film might have benefited from the inclusion of real physicists, rather than actors, talking about their excitement over the Higgs announcement.

Collider is not the place to learn in-depth physics. Nor should it be. Instead, it succeeds in showcasing a monumental scientific endeavour from a human perspective — and leaves visitors hungry to find out more. ■

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